

Claims

- 1 1. A laser light source comprising:
2 a cage defining a cavity formed from a plurality of self-assembling protein molecules,
3 and
4 one or more cargo elements located within the cavity, wherein at least one of the cargo
5 elements defines a cavity that contains a fluid and or a quantum dot,
6 wherein the cargo element cavity and or its contained fluid internally reflects one or more
7 wavelengths of light in response to an electromagnetic excitation
8 and
9 wherein the laser light source emits one or more photons of light in response to
10 a stimulus deforming the cargo element cavity.
- 1 2. A laser light source according to claim 1 comprising,
2 receptors for capturing and positioning cargo elements within the self-assembling protein
3 cavity.
- 1 3. A laser light source according to claim 2 comprising,
2 a vesicle located within the cage and enclosing one or more cargo elements, wherein the
3 receptors extend through the vesicle to capture and position a cargo element within the
4 vesicle.
- 1 5. A laser light source according to claim 3 comprising,
2 adaptors disposed between the receptors and the cage and binding to the receptors.
- 1 6. A laser light source according to claim 1 comprising,
2 a vesicle located within the cage and enclosing one or more cargo elements.
- 1 7. A laser light source according to claim 1 comprising,
2 molecular tethers for capturing and positioning one or more cargo elements within the
3 cavity
- 1 8. A laser light source according to claim 1 comprising,
2 direct cage bonding for capturing and positioning one or more cargo elements within the
3 cavity.

- 1 9. A laser light source according to claim 1 further comprising, receptors, molecular tethers
2 and direct cage bonding for capturing and positioning one or more cargo elements within
3 the cavity.
- 1 10. A laser light source according to claim 1 further comprising, one or more cargo elements
2 forming a non-permeable cavity.
- 1 11. A laser light source according to claim 3 further comprising, a vesicle forming a non-
2 permeable cavity.
- 1 12. A laser light source according to claim 3 comprising,
2 a vesicle defining a cavity located within the cage, wherein a fluid and or a quantum dot
3 are contained in the vesicle cavity.
- 1 13. A laser light source according to claim 1, wherein the cage is electrically neutral and
2 inhibits charge transfer between the cage and its enclosed cargo elements.
- 1 14. A laser light source according to claim 3, wherein the vesicle is electrically neutral and
2 inhibits charge transfer between the vesicle and its enclosed cargo elements.
- 1 15. A laser light source according to claim 4, wherein the receptors and adaptors are
2 electrically neutral and inhibit charge transfer between the vesicle and cage and their
3 enclosed cargo elements.
- 1 16. A laser light source according to claim 1, wherein the cage reduces contaminant
2 background radiation to cargo carried within the cage.
- 1 17. A laser light source according to claim 3, wherein the vesicle reduces contaminant
2 background radiation to cargo carried within the vesicle.
- 1 18. A laser light source according to claim 1 comprising, a self-assembling framework of
2 cages to structurally support one or more self-assembling light sources.
- 1 19. A laser light source according to claim 1 comprising a self-assembling electrically neutral
2 substrate of cages to structurally support one or more self-assembling light sources.
- 1 20. A laser light source according to claim 1 comprising, a self-assembling framework of
2 cages to structurally order one or more self-aligning light sources.
- 1 21. A light source according to claim 1, wherein the one or more cargo elements is a single
2 cargo element. comprising a cargo element that defines a cavity that contains a fluid and
3 or a quantum dot.

- 1 22. A light source according to claim 1, wherein the one or more cargo elements are a
2 plurality of cargo elements.
- 1 23. A light source according to claim 22, wherein the plurality of cargo elements are light
2 source cargo elements.
- 1 24. A light source according to claim 22, wherein the plurality of cargo elements are non-
2 light source cargo elements
- 1 25. A light source according to claim 22, wherein at least some of the plurality of cargo
2 elements are light source cargo elements.
- 1 26. A light source according to claim 22, wherein at least some of the plurality of cargo
2 elements are light source cargo elements
- 1 27. A laser light source according to claim 1, wherein the cargo elements respond to stimuli
2 internal and external to the cage.
- 1 28. A laser light source according to claim 3, wherein a vesicle and its contained cargo
2 elements respond to stimuli internal and external to the vesicle.
- 1 29. A laser light source according to claim 1, wherein the cargo element-contained ARC fluid
2 and or the vesicle-contained fluid contains one or more dyes of any suitable type, with or
3 without scattering particles, or with or without other dopants.
- 1 30. A laser light source according to claim 22, wherein a subset of the cargo elements include
2 one or more liquids without dopants or with one or more dopants.
- 1 31. A laser light source according to claim 22, wherein a subset of the cargo elements include
2 a gas or vapor without dopants or with one or more dopants of any suitable type.
- 1 32. A laser light source according to claim 1, wherein a cargo element cavity containing one
2 or more quantum dots comprise a photonic dot.
- 1 33. A laser light source according to claim 3, wherein a vesicle cavity containing one or more
2 quantum dots comprises a photonic dot.
- 1 34. A laser light source according to claim 1, wherein the internal or external deforming
2 stimulus includes one or more stimuli of any suitable type, including but not limited to
3 mechanical, chemical, fluidic, biological, photonic, thermal, sonic, and electrical or
4 electromagnetic stimuli.

- 1 35. A laser light source according to claim 1, wherein a spherical cargo element cavity and or
2 a spherical vesicle cavity is deforming in response to an external stimulus, and the so
3 deformed spherical cavity is an asymmetric resonant cavity (ARC)
- 1 36. A laser light source according to claim 1, wherein a spherical fluid droplet contained
2 within a spherical cargo element cavity and or contained within a spherical vesicle cavity
3 is deformed in response to a deformed cargo element cavity and or to a deformed vesicle
4 cavity, and the so deformed spherical droplet thereby becomes an asymmetric resonant
5 cavity (ARC).
- 1 37. A laser light source according to claim 1, wherein the ARC deforms from a first
2 geometry to a second geometry and the wavelength of the one or more photons is
3 dependent on the second geometry.
- 1 38. A laser light source according to claim 1, wherein selectable quantum dot energy
2 emissions are used to tune the Q-value and resonant frequency of the ARC photonic dot.
- 1 39. A laser light source according to claim 1, wherein the Q-value (whispering gallery
2 modes) and resonant frequency of the laser are tunable by using an ARC.
- 1 40. A laser light source according to claim 1, wherein the ARC is a Q-switched laser.
- 1 41. A laser light source according to claim 1, wherein the laser light source is an ultrabright,
2 tunable source of light.
- 1 42. A laser light source according to claim 1, wherein there is the ability to couple a high-
2 Q/whispering gallery mode out of the ARC with strong directionality
- 1 43. A laser light source according to claim 1, wherein it operates at an ultralow threshold.
- 1 44. A laser light source according to claim 1, wherein the laser light source is a regulated
2 source of photons for use in quantum computing, quantum networks and quantum
3 cryptography.
- 1 45. A laser light source according to claim 1, wherein the laser light source is a therapeutic
2 agent.
- 1 46. A laser light source according to claim 1, wherein the laser light source is a diagnostic
2 agent.
- 1 47. A laser light source according to claim 1, wherein the laser light source is a sensor agent.
- 1 48. A laser light source according to claim 1, wherein the laser light source is a prosthetic
2 agent.

- 1 49. A laser light source according to claim 1, wherein the cage is bioengineered in whole or
2 in part.
- 1 50. A laser light source according to claim 1, wherein the self-assembling protein molecule is
2 a clathrin molecule.
- 1 51. A laser light source according to claim 1, wherein the cage comprises self-assembling
2 synthetic protein molecules.
- 1 52. A laser light source according to claim 4, wherein receptors, adaptors, and vesicle
2 comprise natural or synthetic protein molecules.
- 1 53. A laser light source according to claim 4, wherein the receptors, adaptors, and vesicle are
2 bioengineered at least in part.
- 1 54. A laser light source according to claim 1, wherein the cage is at least partially coated in a
2 substantially reflective material.
- 1 55. A laser light source according to claim 3, wherein the vesicle is coated at least partially in
2 a substantially reflective material.
- 1 56. A laser light source according to claim 1, wherein the cage is coated at least partially in a
2 substantially non-reflective material.
- 1 57. A laser light source according to claim 3, wherein the vesicle is coated at least partially in
2 a substantially non-reflective material.
- 1 58. A laser light source according to claim 1, wherein the cage is at least partially metal
2 coated.
- 1 59. A laser light source according to claim 4, wherein the receptors, adaptors, and vesicle are
2 at least partially metal coated.
- 1 60. A laser light source according to claim 1, wherein the cage is greater than about one
2 nanometer in diameter.
- 1 61. A laser light source according to claim 1, wherein the cage is at least about 50
2 nanometers in diameter.
- 1 62. A laser light source according to claim 1, wherein the cage is at least about 100
2 nanometers in diameter.
- 1 63. A laser light source according to claim 1, wherein the cage is substantially symmetric
2 with respect to a plane.

- 1 64. A laser light source element according to claim 1, wherein the cage has substantially
2 icosahedral geometry.
- 1 65. A light source according to claim 1, wherein multiple light sources are physically linked
2 together.
- 1 66. A light sources according to claim 1, wherein multiple self-assembling light sources are
2 functionally linked together.
- 1 67. A laser light source according to claim 1, wherein the laser light source forms a hybrid
2 system upon its physical or functional integration with elements in vitro and in vivo.
- 1 68. A method for forming a light source comprising
2 self-assembling protein molecules into a cage defining a cavity, and locating one or more
3 cargo elements within the cavity, wherein,
4 at least one of the cargo elements defines a cavity that contains a fluid and/or a quantum
5 dot,
6 wherein the cargo element cavity and or its contained fluid internally reflects one or more
7 wavelengths of light in response to an electromagnetic excitation.
8 and
9 wherein the laser light source emits one or more photons of light in response to
10 a stimulus deforming the cargo element cavity.